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EXECUTIVE SUMMARY

Monticello Station
NRC Inspection Report 50-263/97007(DRS)

This inspection included a review of the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The report covers a one week on-site inspection by regional and Office of Nuclear Reactor Regulation (NRR) inspectors, and a contractor from Brookhaven National Laboratory.

In general, the program met the requirements of the maintenance rule (MR); however, issues were identified with the establishment of performance criteria and the structural monitoring program. Two violations, one unresolved item, and one inspection follow-up item were identified during the inspection.

Operations

- Operators' knowledge was consistent with their responsibility for implementation of the MR. There was no indication that the MR detracted from the operators' ability to safely operate the plant. The MR helped the operators monitor and limit the risk associated with taking equipment out-of-service.

Maintenance

- Scoping of structures, systems, and components (SSCs) was considered good. The use of MR system basis documents was considered a good process to compile information.

- The expert panel was a well-balanced group of qualified, experienced personnel. The panel used their experience in conjunction with the probabilistic risk assessment (PRA) to assess SSC risk significance.

- The approach to establishing the risk ranking for SSCs within the scope of the MR was adequate. However, weaknesses in that approach included the use of an outdated PRA, inadequate basis by the expert panel for several systems, and the expert panel's determinations were not well documented.

- The procedure for performing periodic assessments met the requirements of the rule and the intent of the Nuclear Management Resource Council (NUMARC) implementing guidance. The quarterly assessments were considered acceptable, although goal setting plans were not well defined in all cases.

- The process to balance availability and reliability appeared adequate, although the established performance criteria were not considered acceptable in all cases to ensure that the results of the process were valid.

- The process to control on-line maintenance was an acceptable means of implementing the equipment out-of-service evaluation. The PRA group's daily involvement with the scheduling group, the policy of allowing only one technical specification limiting condition of operation at a time, and the use of Equipment

Out-of-Service (EOOS) software were considered a strength. The use of a shutdown PRA in the scheduling and management of outages was also viewed as a strength.

- The performance criteria established to monitor SSC functions under the MR were considered higher than appropriate and in most cases not adequately based on PRA assumptions or historical data. Several standby SSCs were identified that did not have adequate performance criteria to monitor the associated function. As a result, the licensee was unable to demonstrate that the performance or condition of SSCs within the scope of 10 CFR 50.65 were being effectively controlled through the performance of appropriate preventive maintenance.

- The licensee had adequately scoped tanks, supports, buildings, and enclosures as structures under the MR. The guidance and documentation of the structure monitoring program were weak and it was unclear if the intent of the MR and the NUMARC guidance was being met with the program currently in place.

- Goals were established for three systems being monitored under the (a)(1) category. The inspectors determined that goals established for SSCs monitored under (a)(1) and corrective actions taken to improve SSC performance were acceptable.

- The inspectors concluded that the licensee had adequate processes in place to incorporate information from industry operating experience into goal development and the periodic assessments.

- The material condition of the plant systems examined was very good. With a few minor exceptions, the systems appeared to be well managed and were free of corrosion, oil, water, steam leaks, and extraneous material.

Quality Assurance

- The self-assessment and quality assurance audit identified a number of issues, although not all actions were resolved or completed at the time of the inspection. The use of independent personnel and information attained from previously issued Nuclear Regulatory Commission MR inspection reports provided significant insights into the MR program.

Engineering

- The system engineers (SEs) were experienced and knowledgeable about their systems. Heavy reliance on the MR coordinator to implement the program, while limiting the SE's MR responsibilities, appeared acceptable.

Report Details

Summary of Plant Status

The plant was in a forced outage during the inspection.

Introduction

This inspection included a review of the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The report covers a one week on-site inspection by four regional and NRR inspectors, and a consultant from Brookhaven National Laboratory.

I. Operations

O4 Operator Knowledge and Performance

O4.1 Operator Knowledge of Maintenance Rule

a. Inspection Scope (62706)

During the inspection of the implementation of 10 CFR 50.65, the inspectors interviewed two senior reactor operators (SROs) and three reactor operators to determine if they understood the general requirements of the MR and their particular duties and responsibilities for its implementation.

b. Observations and Findings

The inspectors determined that the operators had a general working knowledge of the MR and their role in its implementation. The operators stated that their duties included the timely removal and restoration of equipment and recording the equipment out-of-service times.

The operators indicated that the MR was integrated with their day-to-day activities, and that the MR did not impose additional administrative burdens that distracted them from their responsibility to safely operate the plant. The operators noted that the MR aided their decision-making process as to the equipment that could be safety taken out-of-service.

c. Conclusions

Operators' knowledge was consistent with their responsibility for implementation of the MR. There was no indication that the MR detracted from the operators' ability to safely operate the plant. The MR helped the operators monitor and limit the risk associated with taking equipment out-of-service.

II. Maintenance

M1 Conduct of Maintenance (62706)

M1.1 SSCs Included Within the Scope of the Rule

a. Inspection Scope

The inspectors reviewed the scoping documentation to determine if the appropriate structures, systems, and components (SSCs) were included within their MR program in accordance with 10 CFR 50.65(b). The inspectors used Inspection Procedure 62706, "Maintenance Rule," NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," as references during the inspection.

b. Observations and Findings

The SSCs within the scope of the MR included both safety-related and nonsafety-related SSCs. EWI-05.02.01, "Monticello Maintenance Rule Program Document," focused on SSC function rather than individual system components which required modification of some system boundaries for MR purposes. A boundary definition guidance document was issued to provide general guidelines for defining MR system boundaries. In addition, some system basis documents contained specific system boundaries. The system basis documents were developed to compile the MR decisions and bases for each system into a single document. This included detailed system functions, bases for scoping decisions, risk determination decisions, and performance criteria bases. The documented risk determination and performance criteria bases, however, were not sufficiently detailed in all cases to support the results.

In general, scoping of systems at Monticello was good. The licensee considered 93 systems during the scoping phase; of these 80 systems were determined to be within the MR scope. Scoping determination for each system was documented in the expert panel meeting minutes. The MR integrated scoping matrix listed the function of each SSC including backup functions related to other SSCs. The matrix also identified the scoping question results that included or excluded each SSC function from the MR scope. SSCs reviewed by the inspectors were properly scoped within the requirements of the MR.

c. Conclusions

The inspectors concluded that SSC functions were properly scoped into the MR program. The use of MR system basis documents was considered a good process to compile information.

M1.2 Safety (Risk) Determination, Risk Ranking, and Expert Panel

a. Inspection Scope

Paragraph (a)(1) of the rule requires that goals be commensurate with safety. Additionally, implementation of the rule using the guidance contained in NUMARC 93-01, required that safety be taken into account when setting performance criteria and monitoring under paragraph (a)(2) of the rule. This safety consideration was to be used to determine if the SSC should be monitored at the system, train, or plant level. The inspectors reviewed the methods and calculations that the licensee established for making these risk determinations. The inspectors also reviewed the risk determinations that were made for the specific SSCs reviewed during this inspection. NUMARC 93-01 recommended the use of an expert panel to establish safety significance of SSCs by combining probabilistic risk assessments (PRA) insights with operations and maintenance experience, and to compensate for the limitations of PRA modeling and importance measures. The inspectors reviewed the composition of the expert panel and the experience and qualifications of its members. The inspectors reviewed the licensee's expert panel process and the information available which documented the decisions made by the expert panel. The inspectors interviewed several members of the expert panel to determine their knowledge of the MR and to understand the functioning of the panel.

b.1 Observations and Findings on the Expert Panel

The expert panel members appeared knowledgeable concerning the requirements of the MR and understood their responsibilities as expert panel members. The panel had received training and demonstrated an understanding in the use of PRA. The expert panel met on a quarterly basis, although meetings could be held more frequently, if needed. Meeting minutes appeared to accurately describe the panel's activities, although the bases for decisions were not always well documented.

The panel composition included personnel from maintenance engineering, system engineering, PRA group, scheduling, operations quality services, and the design basis document group. Panel members all held SRO licenses or SRO certifications, with 11 to 30 years of plant experience. The panel used their experience in conjunction with the PRA to assess SSC risk significance. The expert panel's responsibilities also included review and approval of scoping decisions, goal-setting action plans, performance criteria selection, and the dispositions to reclassify SSCs from (a)(2) to (a)(1) and (a)(1) to (a)(2).

c. Conclusions

The expert panel was a well-balanced group of qualified, experienced personnel. The panel used their experience in conjunction with the PRA to assess SSC risk significance.

b.2 Observations and Findings on Risk Determinations

b.2.1 Analytical Risk Determining Methodology

Plant-specific PRA studies were used to rank SSCs with regard to their risk significance. These studies included the Monticello Individual Plant Examination (IPE) and Individual Plant Examination of External Events (IPEEE). The plant-specific PRA model was a linked-fault-tree model, and the CAFTA computer code was used to quantify the presolved cutsets of the PRA model. The IPE study, specifically for internal events and internal flooding, was based on a Level 1 PRA, which provided information on core damage frequency (CDF), and a complete Level 2 analysis of plant specific containment structural failure.

For the risk ranking process, the licensee staff used a truncation level of 1E-9. This was four orders of magnitude less than the overall CDF estimate of 1.3E-5 per reactor year. The inspectors considered that the truncation level of 1E-9 used for the risk significance determination process was reasonable.

The inspectors considered the general quality, scope (Level 1 and 2), and level of detail of the IPE study to be acceptable to support implementation of the MR. However, the PRA, although updated following the 1995 refueling outage to reflect the plant configuration, incorporated unavailability and unreliability data based on operating experience of the plant from 1978 to 1987. Not having updated the PRA to reflect more recent plant data was considered by the inspectors to be a weakness in the implementation of the MR. At the time of the inspection, the licensee staff indicated that the PRA databases would be updated to support the MR following the next refueling outage (1998).

b.2.2 Adequacy of Expert Panel Evaluations

The inspectors reviewed the MR program document and the expert panel meeting minutes, which were determined to adequately describe the risk significance determination process. Of the 80 systems within the MR scope, the expert panel determined 30 systems were of high safety significance.

An expert panel process in conjunction with a PRA ranking methodology was used to determine the risk significance of SSCs in and out of the scope of the rule. The expert panel identified the non-safety related diesel generator as a high safety significant system based on station blackout events modelled in the PRA and included it under the MR scope, even though it did not meet the risk significance criteria.

For SSCs modeled in the PRA, two importance measures based on CDF were evaluated by the expert panel (risk achievement worth (RAW) and Fussell-Vesely (F-V)), in addition to 90% CDF contribution. The licensee first evaluated the importance of PRA basic events relative to the RAW and F-V importance measures at both the component and system level. If a basic event's importance measure met one or more of the criterion, then the SSC associated with that basic event was judged to be potentially high safety significant. The evaluation of CDF contribution criterion identified three systems that did not meet the RAW or F-V criteria (i.e., the condenser, alternate nitrogen, and containment vent systems). The expert panel reviewed these systems and determined them to be low safety significant. Although there were no documented bases for these determinations, based on discussions with members of the expert panel, the inspectors found the results to be acceptable.

The expert panel determined the risk significance of SSCs not modeled in the IPE by reviewing the IPEEE, outage shutdown PRA, and Level 2 results. The inspectors reviewed a sample of SSCs covered by the MR that the expert panel had categorized as low safety significant to assess if the expert panel had adequately established the safety significance of those SSCs. In general, the details of the expert panel determinations were not well documented, which required the inspectors to request additional information for the risk determination of several low safety significant SSCs. The basis for the risk significance determination for the control room, upper/lower 4KV area, and diesel fuel oil systems was reviewed and found acceptable. The licensee, however, determined that the risk determination bases were insufficient for the condensate storage tank (CST), residual heat removal-shutdown cooling (RHR-SDC), and the containment isolation valves (CIV), and recommended that the expert panel re-evaluate these systems. The inspectors noted the CST and the RHR-SDC system were already adequately monitored as would be required for a high safety significant SSC. The CIVS were not adequately monitored as discussed in Section M1.6.b.1 of this report.

The inspectors observed the deliberations of the expert panel meeting on June 6, 1997. The agenda included a number of issues identified during the inspection including the preliminary results of the sensitivity study for reliability performance criteria, and the risk determination of the CST and the RHR-SDC system. The discussions reflected a balanced evaluation by the panel, considering both risk and operational concerns.

c.2 Conclusions on Risk Determinations

The licensee's approach to establishing the risk ranking for SSCs within the scope of the MR was adequate. However, weaknesses in that approach included the use of an outdated PRA, inadequate bases by the expert panel in the case of the CST and RHR-SDC systems, and the expert panel's determinations were not well documented.

M1.3 (a)(3) Periodic Evaluations

a. Inspection Scope

Paragraph (a)(3) of the MR requires that performance and condition monitoring activities, associated goals, and preventive maintenance activities be evaluated, taking into account where practical, industry wide operating experience. This evaluation was required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The inspectors reviewed both the procedural guidelines for these evaluations and completed quarterly evaluations.

b. Observations and Findings

The licensee's MR program document provided adequate guidance for preparing periodic assessments, which met the requirements of 10 CFR 50.65(a)(3) and the intent of NUMARC 93-01. The licensee performed periodic assessment on a quarterly basis. The inspectors reviewed a number of quarterly assessments, which included discussions of program revisions, goal setting action plans, discussion of significant issues, and the trending data associated with SSC function performance criteria based on the 2-year rolling average. The periodic assessments were considered acceptable, although the goal setting plans were not well defined in some cases.

c. Conclusions

The procedure for performing periodic assessments met the requirements of the rule and the intent of the NUMARC implementing guidance. The quarterly assessments were considered acceptable; however, goal setting plans were not well defined in some cases.

M1.4 (a)(3) Balancing Reliability and Unavailability

a. Inspection Scope

Paragraph (a)(3) of the MR requires that adjustments be made where necessary to assure that the objective of preventing failures through the performance of preventive maintenance (PM) was appropriately balanced against the objective of minimizing unavailability due to monitoring or PM. The inspectors reviewed the plans to ensure this evaluation was performed as required by the MR.

b. Observations and Findings

Balancing reliability and availability consisted of monitoring SSC function performance against the established performance criteria. If the performance criteria were met, then the criteria were considered balanced. This analysis was performed during the quarterly periodic assessments. Because the unavailability and reliability criteria for some systems were considered high without appropriate basis, these performance criteria were not a good indicator to ensure there was a proper balance. An effort to make the criteria consistent with the PRA and historical data was in progress.

c. Conclusions

The inspectors concluded that the process to balance availability and reliability appeared adequate, although the established performance criteria were not considered acceptable in all cases to ensure the results of the process were valid.

M1.5 (a)(3) On-line Maintenance Risk Assessments

a. Inspection Scope

Paragraph (a)(3) of the MR specified that when removing plant equipment from service the overall effect on performance of safety functions be taken into account. The guidance contained in NUMARC 93-01 required that an assessment method be developed to ensure that overall plant safety function capabilities were maintained when removing SSCs from service for PM or monitoring. The inspectors reviewed the procedures and discussed the process with the maintenance rule coordinator (MRC), the PRA engineer performing on-line risk assessments, plant operators, and planning and scheduling personnel.

b. Observations and Findings

The process for plant safety assessments was documented in procedure EWI-05.02.01, Section 9.0. The EOOS PRA software was used for on-line maintenance risk evaluations. Presolved cutsets of the PRA model were used for the calculations. These models might not contain combinations of low safety significant SSCs, which could have had a high risk impact under unanalyzed conditions. The licensee's PRA staff stated that they expected to fully implement EOOS (i.e., requantify the model instead of manipulating the cutsets) in 1998 to resolve this issue. The plant procedure required the PRA staff to be consulted if more than one high safety significant component was out-of-service. The scheduler maintained a log that identified requests for PRA input and the results.

The inspectors reviewed more than 2 months of recent control room operator logs and did not identify equipment out-of-service configurations with more than two high safety significant components simultaneously out-of-service. Discussion with scheduling personnel indicated that such configurations were rare.

The procedure for evaluating shutdown risk required the scheduling group to request engineering to perform a shutdown risk assessment prior to the outage. Insights were provided to the risk management committee to review the refuel outage schedule. Emergent work was evaluated so that any significant risk increases due to adverse configurations were further evaluated by the outage risk management committee. It was noted that the PRA representative attended the daily morning meeting and was cognizant of emergent issues. The inspectors reviewed the 1996 refueling outage risk assessment and found that it addressed both reactor risk and fuel pool risk.

c. Conclusions

The inspectors concluded that the process was an acceptable means of implementing the equipment out-of-service evaluation specified by (a)(3). The PRA group's daily involvement with the scheduling group, the policy of allowing only one technical specification limiting condition of operation at a time, and the use of EOOS was considered a strength. The use of a shutdown PRA in the scheduling and management of outages was also viewed as a strength.

M1.6 (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

a. Inspection Scope

The inspectors reviewed program documents in order to evaluate the process established to set goals and monitor under (a)(1) and to verify that PM was effective under (a)(2) of the MR. The inspectors also discussed the program with appropriate plant personnel and reviewed the following systems:

(a)(1) systems	(a)(2) systems
Lighting	Residual Heat Removal Service Water
Primary Containment	Residual Heat Removal
Service and Instrument Air	Diesel Fuel Oil
	125 VDC
	250 VDC
	Control Room Emergency Filtration Train
	Reactor Core Isolation Cooling

The inspectors reviewed each of these systems to verify that goals or performance criteria were established in accordance with safety, that industry wide operating experience was taken into consideration where practical, that appropriate monitoring and trending were being performed, and that corrective actions were taken when an SSC failed to meet its goal or performance criteria or experienced a maintenance preventible functional failure (MPFF).

The process to evaluate onsite passive structures for inclusion under the MR was reviewed. Structures evaluated by the inspectors included buildings, enclosures, storage tanks, earthen structures, and passive components and materials housed in the aforementioned. In addition, the inspectors assessed by what means performance of structures determined to be within scope were monitored for degradation.

b. Observations and Findings

The MR program document provided guidelines used to develop goals and performance criteria for SSCs monitored under the MR. The performance criteria and goals were documented and retrievable. Performance criteria were based on a yearly cycle normalized over a 2-year rolling average. In general, the performance critoria established were considered high, and lacked adequate technical justification. For example, the inspectors identified cases where reliability related performance criteria had not been properly established for certain risk significant and standby SSCs. The licensee, however, had not identified a large number of MPFFs, nor did the inspectors find any MPFFs that had not been previously identified by the licensee. This was indicative of good maintenance. The licensee also established an alert or "Yellow," condition that would indicate whether an SSC was approaching a performance criteria to possibly initiate actions to improve the SSC's performance.

Section 9.3.2 of NUMARC 93-01 recommended that risk significant SSC performance criteria be set to assure that the availability and reliability assumptions used in the risk determining analysis (i.e., PRA) were maintained. The inspectors evaluated the performance criteria to determine if they had been adequately set under (a)(2) of the MR, consistent with the assumptions used to establish SSC safety significance. The inspectors noted instances where different values for unavailability and reliability performance criteria than what were used in the PRA had been utilized.

b.1 Performance Criteria for Reliability and Unavailability

In general, the reliability and unavailability performance criteria established for SSCs were high. The criteria did not appear to be based on PRA assumptions for SSCs in the PRA or on historical data for other SSCs. As such, in many cases, the performance criteria established were not a good indicator of the effectiveness of maintenance. This concern was also identified by the licensee during a recent quality assurance (QA) audit; however, actions to address this issue had not been implemented. This issue is discussed in Section M7.1 of this report.

The licensee used procedure EWI-05.02.01 to establish performance criteria for all SSCs under the scope of the MR. Section 6.1 stated "In general, unavailability and reliability will be monitored for all risk significant SSCs unless a sufficient justification exists for not monitoring both. For non-risk significant standby SSCs, unavailability or reliability or condition monitoring or a combination of these will be used."

The inspectors identified four examples where the licensee did not establish reliability or unavailability performance criteria for standby SSCs that would demonstrate effective PM. These included the primary containment isolation system to address the closure function of the CIVs, the diesel fuel oil standby pump, the reactor building component cooling water standby pump, and primary radiation monitors standby isolation functions. Although the licensee had identified these issues in their self-assessment, this is considered a violation of (a)(2) of the MR for failing to establish appropriate performance criteria that could demonstrate that these standby SSCs were effectively controlled through the performance of appropriate PM (VIO 263/97007-01(DRS)).

The inspectors reviewed the sensitivity study for high safety significant systems to determine if the reliability and availability performance criteria established were maintained or adjusted to the reliability and unavailability assumptions used in the PRA. The baseline CDF for Monticello was 1.3E-5. The reliability performance criteria increased the CDF to 4.e-5, and the unavailability performance criteria increased the CDF to 4.e-5, assuming that system performance was at the performance criteria limit for each system. The sensitivity study combining the affect of both reliability and availability increased the CDF probability to approximately 9.e-5. However, the licensee did not use the reliability performance criteria values in all cases, but incorporated PRA values such that the overall CDF remained acceptable. As a result, the study did not address the performance criteria for all the risk-significant components that may be sensitive to CDF increases. At the end of the inspection, the licensee was in the process of revising performance criteria to address the inspectors' concerns.

Since some high safety significant system's performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA, the licensee could not demonstrate that SSCs were being effectively controlled through performance of appropriate PM. The following discusses five examples identified during the inspection.

The RHR pumps reliability performance criteria was 2 MPFF per year or a failure probability of 1.3E-1 per demand, while the PRA assumed a value of 2.38E-3. In the second example, the standby service water pumps reliability performance criteria was 2 MPFFs per year or a failure probability of 3.3E-1 per demand, while the PRA assumed a value of 3.0E-3 per demand. In the third example, the safety relief valves had an unavailability performance criteria of 1000 hours per year or 1.16E-1, while the PRA assumed a value of 8.10E-3. In the four example, the reactor core isolation cooling pump reliability performance criteria was 2 MPFF per year or a failure probability of 0.5 per demand, while the PRA assumed a value of 1.36E-2. In the fifth example, the residual heat removal service water pumps reliability performance criteria was 2 MPFFs per year or a failure probability of 8.69E-2 per demand, while the PRA assumed a value of 9.98-4 per demand. The failure to relate the number of MPFFs and unavailability to the probability assumptions in the PRA is considered a violation of (a)(2) of the MR since the licensee failed to define performance criteria that could demonstrate that these SSCs were effectively controlled through the performance of appropriate PM (VIO 263/97007-02(DRS)).

b.2 <u>Performance Criteria for Low Safety Significant Normally Operating SSCs</u>

The licensee established performance criteria for low safety significant normally operating SSCs using the guidelines contained in NUMARC 93-01. Plant level performance criteria established included the following:

	Yellow or Alert Value	Red or (a)(1) Value
Unplanned Reactor Scrams	> 1/year	≥ 2/year
Unplanned Capability Loss	≥ 3.5%/year	≥ 4.5%/year
Unplanned ESF Actuations	≥ 6.5/year	≥ 7.5/year
Safety System Failures	≥ 1.5/year	≥ 2.0/year
Unplanned Shutdown Deviations	> 1/year	> 2/year

The use of unplanned shutdown deviations, for SSCs needed during shutdown operations, (e.g., neutron monitoring, fuel handling, residual heat removal, spent fuel pool cooling) was an enhancement to the monitoring program. Some of the plant level performance criteria did not apply to each normally operating SSC. The licensee determined which performance criteria provided meaningful information to monitor each system. On a limited basis, a condition monitoring criteria from other existing programs (e.g., erosion/corrosion) was added to enhance monitoring. If a plant level criteria was exceeded, a condition report would be initiated to determine the cause and whether a specific SSC should be monitored under (a)(1).

The inspectors determined that some of the plant level performance criteria did not appear adequate to verify that effective PM was being achieved for low safety significant normally operating SSCs. Because of the 2-year rolling average, the reactor could have 3 scrams or have 14 ESF actuations in a 1-year period and not exceed the respective plant level performance criteria. Actions addressing this issue will be reviewed during the close-out of the inspection follow-up (IFI) of the QA audit discussed in Section M7.1 of this report.

b.3 <u>Goals Established for (a)(1) SSCs</u>

The emergency lighting, primary containment, and instrument air systems were monitored under (a)(1) of the MR. These systems were discussed in more detail in Section M2.1 of this report. The licensee identified appropriate goals to monitor SSCs under (a)(1) of the MR, although the goals in some cases were not well defined in the periodic assessment reports. The corrective action plans appeared appropriate to improve the performance of these SSCs.

The expert panel reviewed and approved the disposition of SSCs to (a)(2). The only SSC dispositioned to (a)(2) was the residual heat removal system. This dispositioning to (a)(2) was considered appropriate and is discussed in more detail in Section M2.1 of this report.

b.4 <u>Structures and Structure Monitoring</u>

Surveillance Test 1385, "Periodic Structural Inspection," Revision 0, was used to monitor structures under the MR scope. This procedure; however, was under revision at the time of the inspection. A structures basis document, dated June 2, 1997, provided justification for the licensee's scoping determinations. The inspectors concluded that the structures identified under the MR scope, with the recent addition of seven structures, were acceptable.

The licensee stated they had completed the baseline inspections, with the exception of the seven structures recently added to the scope. A schedule was established to complete these inspections in a timely manner that was considered acceptable. The completed baseline inspections consisted of a list of ten structures that were considered as either acceptable, acceptable with deficiencies, or unacceptable. The licensee identified the condition of all structures within scope of the MR as acceptable; no deficiencies with structures were documented in the MR program. Discussions with the resident inspector staff revealed several deficiencies where operability evaluations were in place or structural repairs had been completed subsequent to the baseline inspection. The structural engineer stated that a notebook was kept of identified deficiencies; however, the inspectors were unclear how this was incorporated into the MR program. Credit was taken for structural inspections performed in 1986 as part of the baseline inspections. This was considered inappropriate since these inspections were performed over 10 years ago and the program required inspecting the condition of major structures on a 5-year frequency.

Regulatory Guide 1.160, Revision 2, stated that a structure would be considered (a)(1) if either (1) degradation was to the extent that the structure may not meet its design basis or (2) the structure had degraded to the extent, that, if the degradation were allowed to continue uncorrected until the next normally scheduled assessment, the structure may not meet its design basis. The program did not appear to require placing a structure into (a)(1) based on case (2). The licensee stated that the program would be revised to address this issue.

The structure monitoring procedure did not provide guidance to ensure all areas of a structure were inspected. For example, with regard to the turbine building and the reactor building, it was unclear how each room or zone within these buildings were inspected. The procedure also did not give any guidance as to what should be inspected (e.g., component supports, block walls, roofs, structural steel) or criteria defining what was acceptable for these inspections. The MR program also did not appear to incorporate other existing structural inspection programs.

In general, the documentation of the structure monitoring program was weak and it was unclear if the intent of the MR and the NUMARC guidance were being met. This was an unresolved item (263/97007-03(DRS)) pending completion of the licensee's changes to the structural monitoring program and further review by the NRC.

c. Conclusions

The performance criteria established to monitor SSC functions under the MR were considered higher than appropriate and in some cases not adequately based on PRA assumptions or historical data to monitor the effectiveness of maintenance as required by the MR. Several standby SSCs were identified that did not have adequate performance criteria to monitor the associated function. As a result, two violations were identified where the licensee was unable to demonstrate that the performance or condition of SSCs within the scope of 10 CFR 50.65 were being effectively controlled through the performance of appropriate PM.

Tanks, supports, buildings, and enclosures were adequately scoped as structures under the MR. The guidance and documentation of the structure monitoring program were weak and it was unclear if the intent of the MR and the NUMARC guidance was being met with the program currently in place.

The licensee had established goals for three systems being monitored under the (a)(1) category. The inspectors determined that goals established for SSCs monitored under (a)(1) and corrective actions taken to improve SSC performance were acceptable.

M1.7 Use of Industry-wide Operating Experience

a. Inspection Scope

Paragraph (a)(1) of the rule states that goals shall be established commensurate with safety and, where practical, taking into account industry-wide operating experience (IOE). Paragraph (a)(3) of the rule states that performance and condition monitoring activities and associated goals and PM activities shall be evaluated at least every refueling cycle. The evaluation shall be conducted taking into account

IOE. The inspectors reviewed the program to integrate IOE into their monitoring program for maintenance.

b. Observations and Findings on Use of Industry-wide Operating Experience

The methodology for evaluating and initiating action for IOE information was to ensure that lessons learned were used to prevent occurrences of such events and to improve plant safety and reliability.

Interviews and reviews indicated that the nuclear network coordinator was responsible for providing nuclear network information including operating plant experience reports to the MRC for possible MR scoping changes, and to the SEs via condition reports for review. In addition, the program required reviewing IOE when setting goals for (a)(1) systems.

c. Conclusions for Use of Industry wide Operating Experience

The inspectors concluded that the licensee had adequate processes in place to incorporate information from IOE into goal development and the periodic assessments.

M2 Maintenance and Material Condition of Facilities and Equipment (61706, 71707)

M2.1 General System Review

a. Inspection Scope

The inspectors conducted a detailed examination of several systems from a MR perspective to assess the effectiveness of the program when it was applied to individual systems.

b.1 Observations and Findings for the Emergency Lighting System

The emergency lighting system was considered a low safety significant, standby system with performance criteria to monitor reliability. The lighting system was being monitored under (a)(1) of the MR as a result of repetitive battery failures on emergency lighting units. The licensee replaced the batteries for the lights within the MR scope and established a battery replacement schedule. A PM task for each battery was established to schedule battery replacements based on 80 percent of the vendor's estimated battery life. The goals established appeared appropriate to return the system to (a)(2).

b.2 Observations and Findings for the Primary Containment System

The primary containment system was considered a high safety significant system with performance criteria to monitor overall local leak rate testing (LLRT). The performance criteria did not address the CIV's closing function.

The primary containment was monitored under (a)(1) of the MR after the LLRT performance criteria of 0.6 La was exceeded during the last refueling outage. The components responsible for the LLRT failure were the main steam isolation valves (MSIVs). The licensee replaced the two outboard MSIVs and replaced the disks on the inboard valves with disks of a slightly different design to eliminate valve leakage. The primary containment will remain in (a)(1) status until completion of a successful LLRT during the next refueling outage. The goals established appeared appropriate to return the system to (a)(2).

b.3 Observations and Findings for the Instrument and Service Air (AIR) System

The AIR system was considered a high safety significant system with performance criteria to monitor reliability on the system level and unavailability and reliability on the compressor level. The performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA. The AIR system was being monitored under (a)(1) of the MR as a result of three compressor failures in November and December 1996. The failures were on separate compressors and were not considered repetitive. The corrective action plans for the AIR system included the installation of a new high pressure section and an air discharge check valve on the #11 compressor, and replacement of the temperature switch on the #14 compressor.

b.4 Observations and Findings for Residual Heat Removal Service Water (RHRSW) System

The RHRSW system was considered a high safety significant, standby system with performance criteria to monitor reliability and unavailability at the train and pump level. The performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA. The RHRSW system was being monitored under (a)(2) of the MR.

Pump unavailability performance data increased during the past year due to several failures of an air vent valve sticking open on RHRSW pump #11. The licensee determined the problem was design related and installed a temporary modification that appeared to have corrected the problem. A permanent design change was scheduled to be installed on all RHRSW pumps during the next outage.

b.5 Observations and Findings for the Residual Heat Removal (RHR) System

The RHR system was considered a high safety significant, standby system with performance criteria to monitor reliability and unavailability. The performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA. The RHR system had previously been monitored under (a)(1) due to excessive unavailability, which resulted from a mispositioned valve during a valve line-up. The licensee concluded that the unavailability was not maintenance related, and that the system should be monitored under (a)(2) of the MR. System performance was good, as no Miffs or unavailability (except the valve mispositioning issue) concerns were identified.

b.6 Observations and Findings for the 125 Volt and 250 Volt DC Systems

The 125 and 250 volt DC systems were considered high safety significant systems with performance criteria to monitor reliability and unavailability. Both DC systems were being monitored under (a)(2) of the MR. System performance was good, as no Miffs or unavailability concerns were identified.

b.7 Observations and Findings for the Diesel Fuel Oil (DOL) System

The DOL system was considered a low safety significant, normally operating system being monitored with plant level performance criteria. One of the DOL pumps was normally in standby such that monitoring was required at the system or train level. The DOL system was being monitored under (a)(2) of the MR. System performance was good, as no Miffs or unavailability concerns were identified.

b.8 Observations and Findings for the Control Room Emergency Filtration Train (EFT) System

The EFT system was considered a low safety significant, standby system with performance criteria to monitor reliability and unavailability. The EFT system was being monitored under (a)(2) of the MR. System performance was good, as no Miffs or unavailability concerns were identified.

b.9 Observations and Findings for the Reactor Core Isolation Cooling (RCIC) System

The RCIC system was considered a high safety significant, standby system with performance criteria to monitor reliability and unavailability. The performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA. The RCIC system was being monitored under (a)(2) of the MR.

One MPFF assigned to RCIC concerned a controller failure due to a blown fuse. A second MPFF that affected the RCIC system was the failure of the RCIC room cooler that spilled water onto the RCIC vacuum and condensate pumps causing an electrical ground failure of the pumps. The second MPFF was assigned to the ventilation support system. The licensee replaced the fuse and the room cooler cooling coil. The inspectors found that the licensee's actions were acceptable.

c. Conclusions for General System Review

The inspectors concluded that the licensee had properly classified each SSC as category (a)(1) or (a)(2). In some cases the performance criteria were not maintained or adjusted to the reliability and availability assumptions in the PRA. Two SSC functions were not monitored by adequate performance criteria. The corrective actions, both in progress and planned, for SSCs in (a)(1) appeared adequate. The inspectors did not identify in the SSCs reviewed any Miffs not previously identified. SSC functions for the system reviewed were properly scoped under the MR.

M2.2 Material Condition

a. Inspection Scope

In the course of verifying the implementation of the MR using Inspection Procedure 62706, the inspectors performed walkdowns using Inspection Procedure 71707, Plant Operations, to examine the material condition of the systems listed in Section M1.6.

b. Observations and Findings

With minor exceptions, the systems were free of corrosion, oil leaks, water leaks, trash, and based upon external condition, appeared to be well maintained.

c. Conclusions

In general, the material condition of the systems examined was very good.

M7 Quality Assurance in Maintenance Activities (40500)

M7.1 Licensee Self-Assessments of the Maintenance Rule Program

a. Inspection Scope

The inspectors reviewed a self-assessment conducted in May 1997 and a quality assurance (QA) audit conducted from March through May 1997, both of which pertained to implementation of the MR.

b. Observations and Findings

The self-assessment and QA audit identified a number of good issues and provided appropriate recommendations. In addition, a number of positive aspects of the MR program were identified. The self-assessment was conducted by a multi-disciplined team, which included technical consultants and MRCs from two other facilities. Guidance for the evaluations included reviewing previously issued NRC MR inspection reports. This approach provided an independent viewpoint, which added to the overall quality of the assessment. The licensee was implementing a number of program changes as a result of the assessment and QA audit, although not all actions were resolved or completed at the time of the inspection. This will be considered an IFI (50-263/97007-04(DRS)) pending completion of licensee actions and review by the NRC.

c. Conclusions

The self-assessment and QA audit identified a number of issues, although not all actions were resolved or completed at the time of the inspection. The use of independent personnel and information attained from previously issued NRC MR inspection reports provided significant insights into the MR program.

III. Engineering

E4 Engineering Staff Knowledge and Performance (62706)

E4.1 Engineer's Knowledge of the Maintenance Rule

a. Inspection Scope (62706)

The inspectors interviewed system engineers (SEs) and managers to assess their understanding of PRA, the MR, and associated responsibilities.

b. Observations and Findings

The inspectors interviewed the SEs assigned responsibility for SSCs selected, and walked down systems with them. The SEs were experienced and knowledgeable about their systems. MR training and PRA familiarization in risk assessment were provided to the SEs. The licensee program limited the SE responsibilities for implementation of the MR to allow SEs to concentrate on other activities. The SE responsibilities for the MR included the MPFF decision process and the preparation of (a)(1) corrective action plans. The licensee's program relied heavily on the MRC and maintenance engineering staff to implement the program.

c. Conclusions

The SEs were experienced and knowledgeable about their systems. The licensee's heavy reliance on the MRC to implement the program, while limiting the SE's MR responsibilities, appeared acceptable.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors discussed the progress of the inspection with licensee representatives on a daily basis and presented the inspection results to members of licensee management at the conclusion of the inspection on June 6, 1997. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary; none was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

* * S. Engelke, Superintendent Electrical and Instrumentation Engineering
* * T. Fallgren, Maintenance Engineer
* J. Fenton, Scheduler
* * M. Hammer, General Superintendent Maintenance
* W. Hill, Plant Manager
* R. Hitter, Operations Shift Supervisor
* * A. Myrabo, Superintendent Maintenance Engineering
* * C. Nierode, PRA Engineer
* * D. Nordeu, Safety Assessment
* M. Onnen, General Superintendent Operations
* * J. Paritz, Maintenance Rule Coordinator
* * P. Riedel, PRA Engineer
* * J. Rootes Generation Quality Services
* * C. Schibonski, General Superintendent Engineering
* * A. Ward, Manager Quality Services
* * T. Wellumson, PRA Engineer
* * A. Wojcnouski, Superintendent

NRC

* * A. Stone, Senior Resident Inspector

* denotes those individuals in attendance at the June 6, 1997, exit meeting.

LIST OF INSPECTION PROCEDURES USED

IP 62706:	Maintenance Rule
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 71707:	Plant Operations

LIST OF ITEMS OPENED

50-263/97007-01(DRS)	VIO	Stand-by SSC Performance Criteria
50-263/97007-02(DRS)	VIO	Reliability/Unavailability PRA Performance Criteria
50-263/97007-03(DRS)	URI	Structure Monitoring Program
50-263/97007-04(DRS)	IFI	Corrective Actions to QA and Self-Assessment

LIST OF ACRONYMS USED

AIR	Instrument and Station Air
BNL	Brookhaven National Laboratory
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CIV	Containment Isolation Valve
CST	Condensate Storage Tank
DOL	Diesel Fuel Oil
DRS	Division of Reactor Safety
EFT	Control Room Emergency Filtration Train
EOOS	Equipment Out-Of-Service
EPRI	Electric Power Research Institute
ESF	Engineered Safety Feature
F-V	Fussell-Vesely
IFI	Inspection Follow-up Item
IOE	Industry Operating Experience
IP	Inspection Procedure
IPE	Individual Plant Evaluation
IPEEE	Individual Plant Evaluation of External Events
MPFF	Maintenance Preventable Functional Failure
MR	Maintenance Rule
MRC	Maintenance Rule Coordinator
MSIV	Main Steam Isolation Valve
NOV	Notice of Violation
NUMARC	Nuclear Management Resource Council
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
PDR	Public Document Room
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
RAW	Risk Achievement Worth
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RHR-SDC	Residual Heat Removal-Shutdown Cooling
RHRSW	Residual Heat Removal Service Water
SE	System Engineer
SRO	Senior Reactor Operator
SSC	Structure, System, or Component
URI	Unresolved Item
VIO	Violation

LIST OF DOCUMENTS REVIEWED

EWI-05.02.01, "Monticello Maintenance Rule Program Document," Rev. 1, May 21, 1997

4AWI-05.01.13, "Design Change Package Review and Approval," Rev. 5, February 3, 1997

4AWI-05.02.06, "Guidelines for Preventive Maintenance During Operation," Rev. 0, November 30, 1993

4AWI-04.01.01, "General Plant Operating Activities," Rev. 17, May 1, 1997

Operations Manual Section C.3, "Shutdown Procedures," Rev. 12, November 11, 1996

Monticello Nuclear Generating Plant Outage Management, Plant Scheduling, Rev. 7

Monticello Nuclear Generating Plant Weekly Planning, Plant Scheduling, Rev. 1

Monticello Nuclear Generating Plant Morning Meeting, Plant Scheduling, Rev. 1

Scheduling Department Work Instruction for Evaluation of the Risk Significance of Removing Equipment from Service, Rev. 0, July 9, 1996

Maintenance Support Group Activities

Monticello Maintenance Rule System Baseline Documents

System Boundary Guidance Document

Individual Plant Examination (IPE) for the Monticello Nuclear Generating Plant, NSPNAD-92003, Rev. 0, February 1992

Individual Plant Examination of External Events (IPEEE) for the Monticello Nuclear Generating Plant, NSPLMI-95001, Rev. 0, February 1995

Monticello Maintenance Rule Periodic Assessment Reports, 3rd quarter - 1996, 4th quarter - 1996, 1st quarter - 1997

4AWI-10.01.03, "Condition Report Process," Rev. 5, April 23, 1997

4AWI-04.05.05, "WO Closeout and Disposition," Rev. 7, November 8, 1996

4AWI-01.04.02, "Plant Maintenance Organization," Rev. 3, April 25, 1997

Surveillance Procedure 1385, "Structures Monitoring," Rev. 0, December 31, 1996

Maintenance Rule Implementation Self-Assessment Evaluation Report, May 15, 1997

AG 1997-M-2, Audit Summary of Maintenance Rule Activities, May 22, 1997